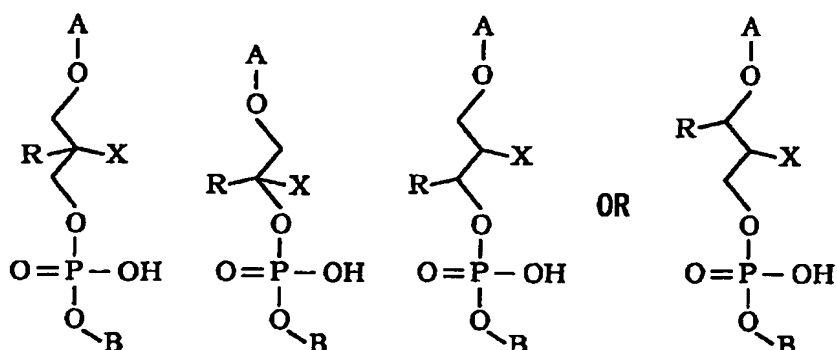


# CLAIMS

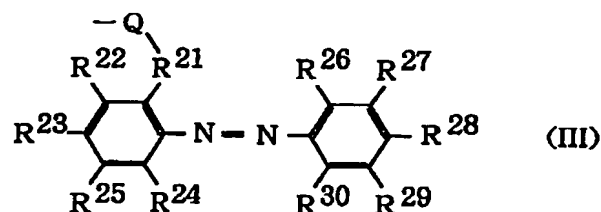
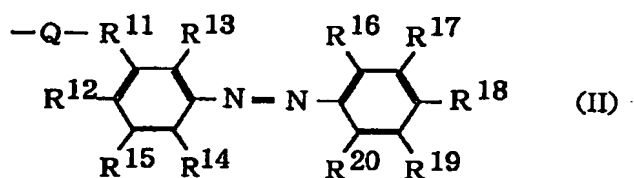
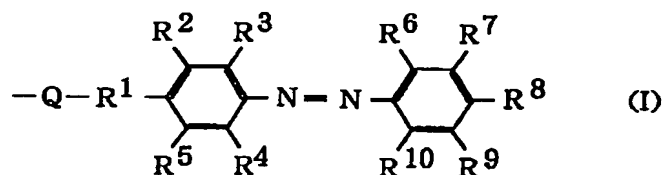
1. DNA enzyme characterized by comprising a nucleotide residue, to which any one organic group selected from the group consisting of azobenzene, spiropyran, stilbene, and derivatives thereof is bonded, at a 3'-side end of a catalytically active loop of the DNA enzyme.

2. The DNA enzyme according to Claim 1, represented by the following Formula:



(in Formulae, A represents a catalytically active loop end, B represents nucleotide or oligonucleotide, X represents any one organic group selected from the group consisting of azobenzene, spiropyran, stilbene, and derivatives thereof, and R represents a hydrogen atom or an alkyl group having the carbon number of 1 to 4).

3. The DNA enzyme according to Claim 2, wherein X is represented by the following Formula (I), (II), or (III):



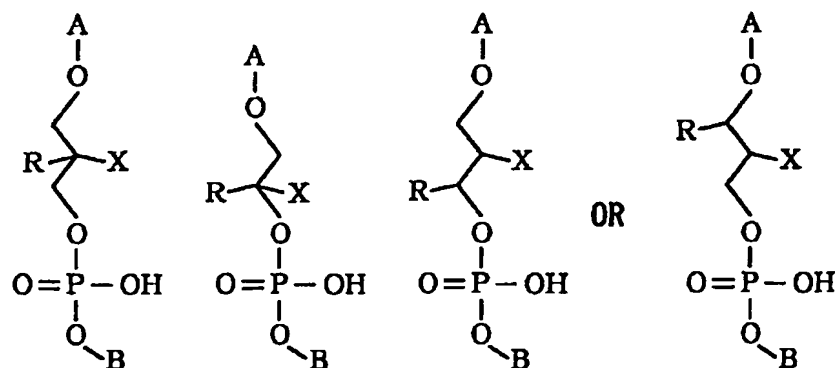
(in Formulae,  $\text{R}^1$ ,  $\text{R}^{11}$ , and  $\text{R}^{21}$  represent independently a direct bond; an unsubstituted or a halogen atom-, hydroxyl-, amino-, nitro-, or carboxyl-substituted alkylene group having the carbon number of 1 to 20; or an unsubstituted or a halogen atom-, hydroxyl-, amino-, nitro-, or carboxyl-substituted alkenylene group having the carbon number of 2 to 20, Q represents a direct bond, an oxygen atom, a  $-(\text{CH}_2)_n\text{-NH-CO-}$  group, or a  $-(\text{CH}_2)_n\text{-CO-NH-}$  group, where  $n = 1$  to 5, and  $\text{R}^2$  to  $\text{R}^{10}$ ,  $\text{R}^{12}$  to  $\text{R}^{20}$ , and  $\text{R}^{22}$  to  $\text{R}^{30}$  represent independently an unsubstituted or a halogen atom-, hydroxyl-, amino-, nitro-, or carboxyl-substituted alkyl group or

alkoxy group having the carbon number of 1 to 20; an unsubstituted or a halogen atom-, hydroxyl-, amino-, nitro-, or carboxyl-substituted alkenyl group or alkynyl group having the carbon number of 2 to 20; a hydroxyl group; a halogen atom; an amino group; a nitro group; or a carboxyl group).

4. A method for controlling the activity of a DNA enzyme, characterized by comprising the step of applying light at specific wavelengths to the DNA enzyme including a nucleotide residue, to which any one organic group selected from the group consisting of azobenzene, spiropyran, stilbene, and derivatives thereof is bonded, and thereby, effecting reversible structural isomerization between a planar structure and a nonplanar structure of the organic group, so as to control the RNA cleavage activity of the DNA enzyme.

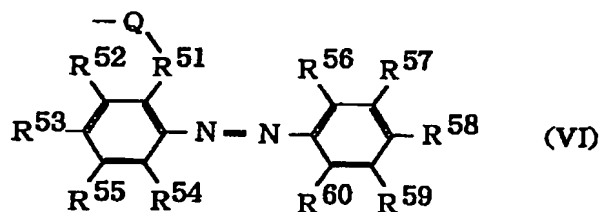
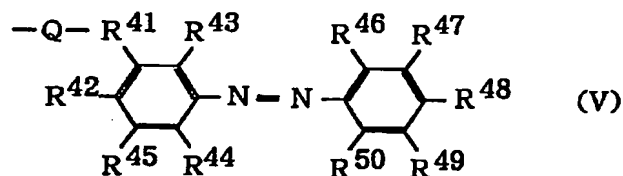
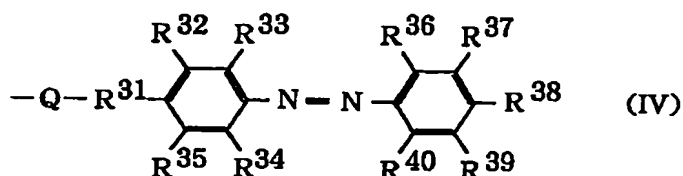
5. The method for controlling the activity of a DNA enzyme according to Claim 4, wherein the introduction position of the nucleotide residue is a 3'-side end of a catalytically active loop.

6. The method for controlling the activity of a DNA enzyme according to Claim 5, wherein the DNA enzyme is represented by the following Formula:



(in Formulae, A represents a catalytically active loop end, B represents nucleotide or oligonucleotide, X represents any one organic group selected from the group consisting of azobenzene, spiropyran, stilbene, and derivatives thereof, and R represents a hydrogen atom or an alkyl group having the carbon number of 1 to 4).

7. The method for controlling the activity of a DNA enzyme according to Claim 6, wherein X is represented by the following Formula (IV), (V), or (VI):



(in Formulae,  $\text{R}^{31}$ ,  $\text{R}^{41}$ , and  $\text{R}^{51}$  represent independently a direct bond; an unsubstituted or a halogen atom-, hydroxyl-, amino-, nitro-, or carboxyl-substituted alkylene group having the carbon number of 1 to 20; or an unsubstituted or a halogen atom-, hydroxyl-, amino-, nitro-, or carboxyl-substituted alkenylene group having the carbon number of 2 to 20, Q represents a direct bond, an oxygen atom, a  $-(\text{CH}_2)_n\text{-NH-CO-}$  group, or a  $-(\text{CH}_2)_n\text{-CO-NH-}$  group, where  $n = 1$  to 5,  $\text{R}^{32}$  to  $\text{R}^{37}$ ,  $\text{R}^{39}$ ,  $\text{R}^{40}$ ,  $\text{R}^{42}$  to  $\text{R}^{47}$ ,  $\text{R}^{49}$ ,  $\text{R}^{50}$ ,  $\text{R}^{52}$  to  $\text{R}^{57}$ ,  $\text{R}^{59}$ , and  $\text{R}^{60}$  represent independently an unsubstituted or a halogen atom-, hydroxyl-, amino-, nitro-, or carboxyl-

substituted alkyl group or alkoxy group having the carbon number of 1 to 20; an unsubstituted or a halogen atom-, hydroxyl-, amino-, nitro-, or carboxyl-substituted alkenyl group or alkynyl group having the carbon number of 2 to 20; a hydroxyl group; a halogen atom; an amino group; a nitro group; or a carboxyl group, and  $R^{38}$ ,  $R^{48}$ , and  $R^{58}$  represent independently an unsubstituted or a halogen atom-, hydroxyl-, amino-, nitro-, or carboxyl-substituted alkyl group or alkoxy group having the carbon number of 1 to 20; an unsubstituted or a halogen atom-, hydroxyl-, amino-, nitro-, or carboxyl-substituted alkenyl group or alkynyl group having the carbon number of 2 to 20; a hydroxyl group; or a halogen atom).